REMARKS

This paper is being provided in response to the March 12, 2003, Office Action for the above-referenced application. In this response, applicant has amended claims 1, 5, 7-9, 15 and 16 in order to clarify that which Applicant deems to be the invention. Applicant respectfully submits that the amendments to the claims are all supported by the originally filed application.

Revised Figures 4 and 6 are being provided with a Request for Drawing Change submitted on even date herewith. These Figures correct the informalities noted in the objections to the drawing by clarifying an embodiment of the power supply unit as reference numeral 3 in Figure 4 and by correcting a typographical error in Figure 6. Accordingly, Applicants respectfully request that this objection be withdrawn.

Claims 7-16 stand rejected under 35 U.S.C. § 112, ¶2. Claims 7-9, 15, and 16 have been amended in accordance with the remarks in the Office Action. In addition, the Office Action posed a question as to the function of the power supply unit recited in claim 9. The power supply is arranged to supply the necessary starting current and drive current according to the claim. Any brushless DC motor comprising a power supply which provides such current and which includes the other elements of the claim is intended to be included in the scope of the claim. Applicant believes that the claims comply with the requirements of § 112 and respectfully requests that the rejection be withdrawn.

The rejection of claims 1-3 and 9-11 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,783,917 (hereinafter referred to as "Takekawa") is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that the claims, as amended herein, are patentable over the cited reference.

As amended, claim 1 recites a method of starting a brushless DC motor including an armature coil in a stator and field magnets in a rotor. The method comprises selecting a first starting waveform from a plurality of stored waveforms, supplying a starting current having the selected first starting waveform for said armature coil while said rotor is in a stationary state, measuring an induced voltage induced in the armature coil by rotation of the rotor, wherein the

rotation is caused by the starting current, and supplying a drive current for the armature coil in response to the induced voltage.

Claims 2-3 depend from claim 1 and recite further patentable features over the base claim. Dependent claim 2 recites that supplying the drive current includes determining a position of the rotor based on the induced voltage, and deciding the drive current based on the determined position. Dependent claim 3 recites that the induced voltage is measured after the starting current is supplied.

As amended, claim 9 recites a brushless DC motor, comprising an armature including an armature coil, a rotor including a plurality of field magnets, a power supply unit arranged to supply current to the armature coil, and a measuring unit. The power supply unit supplies a starting current for said armature coil while said rotor is in a stationary state, and the measuring unit measures an induced voltage induced in the armature coil by rotation of the rotor, the rotation being caused by the starting current. The starting current has a waveform selected from a plurality of stored waveforms The power supply unit supplies a drive current for the armature coil in response to the induced voltage.

Claims 10-11 depend from claim 9 and recite further patentable features over the base claim. Dependent claim 10 recites that recites that the power supply determines a position of the rotor based on the induced voltage, and decides the drive current based on the determined position. Dependent claim 11 recites that the induced voltage is measured after the starting current is supplied.

Takekawa discloses a DC brushless motor that runs in a synchronous mode upon startup, and switches to a position feedback system after a fixed time (see col 6, line 51 – col 7, line 15). In synchronous mode, power is delivered to the motor coils according to a fixed, predetermined schedule, without using a feedback sensor. The fixed time is selected to be long enough to assure that the motor has started in synchronous mode and is running at a sufficiently high speed that its position can be detected (col. 7, lines 5-10).

Applicant respectfully submits that Takekawa does not anticipate independent claims 1 and 9 as amended herein. Each of these claims requires that the starting current waveform be *selected from a plurality of stored waveforms*. In contrast, Takekawa does not disclose selecting a waveform for startup; instead, the coils are simply energized in a single fixed pattern for a period of time long enough to ensure that the rotor is turning.

Since independent claims 1 and 9 are not anticipated by Takekawa, dependent claims 2-3 and 10-11 also cannot be anticipated. For at least the reasons described above, Applicant requests that the rejection be reconsidered and withdrawn.

The rejection of claims 1, 2, 4, 9, 10, and 12 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,245,256 (hereinafter referred to as "Cassat") is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that the claims, as amended herein, are patentable over the cited reference.

Claims 1 and 2 are described above. Claim 4 depends from claim 1 and recites further patentable features over the base claim, that the induced voltage is measured after the starting current is applied.

Claims 9 and 10 are described above. Claim 12 depends from claim 9 and recites further patentable features over the base claim, that the induced voltage is measured after the starting current is applied.

Cassat discloses a brushless DC motor that uses excitation current and back EMF to control the speed of the motor after startup. The motor must be started and accelerated to a nominal speed before the invention of Cassat can operate; Cassat does not describe a startup method (see col. 7, lines 61-66).

Applicant respectfully submits that claims 1 and 9, to a method of starting a brushless DC motor and a motor including a power supply unit that supplies a particular starting current, cannot be anticipated by Cassat, which does not even discuss how to start such a motor. Further,

Cassat provides no teaching or suggestion of selecting a starting current waveform from a plurality of stored waveforms, as recited by both claims as amended herein.

Since independent claims 1 and 9 are not anticipated by Cassat, dependent claims 2, 4, 10 and 12 also cannot be anticipated. For at least the reasons described above, Applicant requests that the rejection be reconsidered and withdrawn.

The rejection of claims 1, 5-7, 9, and 13-15 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,744,921 (hereinafter referred to as "Makaran") is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that the claims, as amended herein, are patentable over the cited reference.

Claim 1 is described above. Claims 5-7 depend from claim 1 and recite further patentable features over the base claim. Dependent claim 5 recites that a second starting waveform is selected from the plurality of waveforms, and is used to start the motor if the first waveform does not result in rotation of the rotor. Claim 6 recites that the direction of rotation of the motor after startup is detected, and the rotor is stopped if it is rotating in the wrong direction. Claim 7 recites that during a first phase, the motor is controlled using induced voltage, until it reaches a predetermined speed. During a second phase subsequent to the first phase, the motor is controlled using the rotor speed.

Claim 9 is described above. Claims 13-15 depend from claim 9 and recite further patentable features over the base claim. Dependent claim 13 recites that a second starting waveform is selected from the plurality of waveforms, and is used to start the motor if the first waveform does not result in rotation of the rotor. Claim 14 recites that the direction of rotation of the motor after startup is detected, and the rotor is stopped if it is rotating in the wrong direction. Claim 15 recites that the motor is initially controlled using induced voltage. After the motor has reached a predetermined speed, the motor is controlled using the rotor speed.

Makaran discloses a control circuit for a five-phase brushless DC motor. The rotor is started from a standstill using a predetermined sequence of energization of the motor windings (col. 8, lines 27-46). If the rotor is already rotating in the wrong direction at startup, the rotor is

stopped at a predetermined position, where a known sequence of currents can be used to start the motor in the correct direction (col. 8, lines 13-26; Fig. 4).

Applicant respectfully submits that claims 1 and 9, as amended herein, are not anticipated by Makaran, because there is no suggestion or teaching in Makaran of selecting a waveform for the starting current from a plurality of stored waveforms, as recited by both independent claims. Instead, Makaran uses a predetermined single sequence to start the rotor.

Since independent claims 1 and 9 are not anticipated by Makaran, dependent claims 5-7 and 13-15 also cannot be anticipated. For at least the reasons described above, Applicant requests that the rejection be reconsidered and withdrawn.
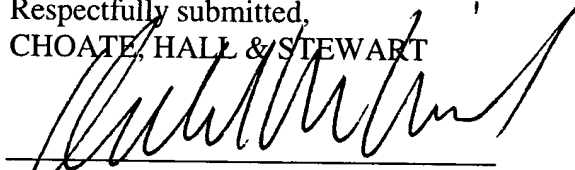
The rejection of claims 8 and 16 under 35 U.S.C. §103(a) as being obvious over Makaran is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that the claims, as amended herein, are patentable over the cited reference.

Dependent claims 8 and 16 depend from claims 1 and 9, respectively, which are described above, and recite further patentable limitations over the base claims. Dependent claim 8 recites that during a first phase, the drive current is selected to turn the rotor with maximum torque. In a subsequent second phase after the rotor speed reaches a predetermined value, the current flow duration of the drive current is controlled based on the rotor speed.

Applicant respectfully submits that claims 8 and 16 are not obvious in view of Makaran for the same reasons discussed above in connection with the rejection of claims 1, 5-7, 9, and 13-15 over the same reference. In particular, there is no suggestion or teaching in Makaran of selecting a starting current waveform from a plurality of stored waveforms, as recited in claims 1 and 9, from which claims 8 and 16 depend. Thus, the reference cannot be used to render these claims obvious.

Based on the above, applicant respectfully requests that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 617-248-4038.

Respectfully submitted,
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